

Springy banks and margins of rills coming down the steep slopes on the south side of the river are bordered by a *Cardamine*, differing at once from the ubiquitous *C. pensylvanica* in its petiolulate rounded leaflets: *C. flexuosa* With., a beautiful European species new to North America. Along the river at the foot of Hannah's Head, on the ledges where we landed, the European *Scrophularia nodosa* L. grew from the crevices and, higher up, above the wooded base of the hill, it grew in many rock-crevices. This was good enough!

(*To be continued*)

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## ASTER PANICULATUS AND SOME OF ITS RELATIVES<sup>1</sup>

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IN a recent paper in this journal the writer<sup>2</sup> presented the results of some studies relating to *Aster lateriflorus* and its allies. The present paper is intended to record further studies of the white asters, particularly of those species centering around *A. paniculatus* Lam. In general this group differs from *A. lateriflorus* in the more paniculate, generally non-secund type of inflorescence, more scabrous-ciliate and more rigid rameal leaves, and the usually firmer leaves of the stem. One species of the previous paper, *A. ontarionis*, seems to lie between *A. lateriflorus* and the *A. paniculatus* group, since, as in the latter species, the heads are scarcely at all racemose while at the same time it has softer rameal leaves and deeper corolla-lobes, thus suggesting *A. lateriflorus*. Likewise, another species, *A. saxatilis*, lies somewhat between *A. paniculatus* and *A. vimineus*. *A. praealtus* of the group now under consideration often has distinctly racemose but not secund heads.

*A. paniculatus* and its relatives have given endless trouble to botanists. One has only to note the numerous names borne by specimens of the various species as they occur in herbaria. Dr. Gray was greatly troubled by them, and his opinion of the white asters was quoted in the previous paper.<sup>3</sup> In that paper the writer took the view that a major difficulty with the group has been the failure to recognize

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<sup>2</sup>RHODORA xxx. 161 (1928).

<sup>3</sup>See also: Proc. Amer. Acad. xvii. 163 (1882).



hybridity as an important element in the confusion. The present studies have tended greatly to strengthen the view that hybridization takes place frequently in the wild between many species of *Asters*, especially in the group under study; and that most herbaria contain an undue number of such specimens because collectors very generally gather only aberrant forms of these common species. Plants interpreted as hybrids of *A. paniculatus* with *A. lateriflorus*, *A. vimineus*, *A. dumosus*, *A. missouriensis*, *A. puniceus*, *A. novi-belgii*, *A. cordifolius*, *A. ericoides*, *A. undulatus*, *A. laevis*, and *A. praealtus* have been seen. Of these, hybrids with *A. puniceus* and *A. lateriflorus* are much the most common. When these hybrids are eliminated, the remaining specimens fall into natural groups. Some of these groups are distinct and should therefore be regarded as species, while others grade into one another and are of the category of varieties. Another factor which makes the delimitation of groups difficult, even when the hybrids are removed, is the plastic nature of some of the species with regard to the environment. Changes in soil, shading, crowding, and other conditions, often give rise to individuals of quite unique appearance. Field studies have furnished at least a partial understanding of the limits of environmental influence.

The recognition of hybrid plants in the herbarium is not always easy. If they could be grown and bred in the garden, their parentage could often be determined, and with comparative ease. Fortunately, however, the parentage does stand out clearly on some specimens. Hybrid *Asters* are rarely exactly intermediate in all their characters. Individual characters, however, are sometimes intermediate though rarely exactly so. More often it would seem that these characters do not blend but behave as units somewhat in Mendelian fashion, being either present or absent as dominance or pure blood dictates, the hybrids recombining in various ways the characters of the two parents. In some hybrid specimens the characters are nearly all of one parent so that only the trained specialist in the group will detect the slight evidence of the inheritance of some one or two characters from the other parent. Continued reviewing of the material is often necessary before all the hybrid specimens in a collection are rightly placed. The work of A. S. Pease<sup>1</sup> on *A. tardiflorus* is a good example of the detail to be considered in each case, though now we know that in addition to the characters used by him, venation and the details of

<sup>1</sup> RHODORA XIX. 98 (1917).



floret-structure must be given careful consideration. Sometimes, however, two different sets of parents may, by the combination of their characters, give so nearly the same appearance in the offspring, that it is not possible to decide which were the true parents. There is abundant opportunity for error in the determination of the parents of hybrid herbarium specimens even with the most painstaking effort. Accurate identification of the parents of hybrid Asters can be made only when accompanied by careful field and genetical studies.

In identifying hybrids of *A. paniculatus* and *A. puniceus* attention must be given to the color of stem, type of cauline hairs, length of internodes, type of branching, shape of leaf-base, character of teeth, prominence of the finer reticulum, rugose upper surface of leaf, degree of scabrosity, type and size of rameal leaves, size of heads, character of involucre as to width, texture and degree of divergence of bracts, color and length of rays, and size of the lobes of the disk-corolla. In the case of crosses between *A. paniculatus* and *A. lateriflorus*, the type of cauline pubescence, leaf-base and leaf-shape, scabrosity, hairiness of midrib, type of branching of the plant, racemose heads, size of heads, type of involucre, number and length of rays, and length of lobes of disk corolla are of importance. Nomenclature in this group of Asters is in a very unsatisfactory state. It is not unusual in herbaria to find specimens of a single form bearing as many as five different names. Some of this confusion is due to synonymy, and some to a poor understanding of the taxonomy of the group. Even the monographer, however, is in difficulty. Many names proposed by Lamarck, Aiton, Willdenow, Nees von Esenbeck, and others, were based largely on plants long under cultivation in European gardens. Exact records of the origin of this cultivated material were for the most part lost, and the plants themselves seem to have changed in character through variation or hybridity during their long period of cultivation so as to be no longer identifiable with any form in the wild state.<sup>1</sup> It seems necessary, therefore, to ignore many of these old names as unidentifiable. Specimens grown in European gardens under some of the names proposed by these authors were obtained by Dr. Gray many years ago, some of them collected even as early as 1820 or 1830, but for the most part they are unlike any strains now known in America. The writer has had little opportunity to study types abroad, and the nomenclature here used must be considered as

<sup>1</sup> See Gray: Proc. Amer. Acad. xvii. 163 (1882).



in some cases provisional. The interpretation of Dr. Gray, who saw some of the types, has been given weight wherever possible.

The study of this group of *Asters* as it occurs in the far west has not been as thorough, and the material seen has not been as complete as in the case of the eastern forms. In general, the present group is distinguished in the west from other species which may resemble it by the pubescent lines on the stems and branches, and generally paniculate habit.

The material forming the basis of this study is that in the Gray Herbarium and the herbarium of Cornell University. A part of the material in the New England Botanical Club herbarium has also been studied, and the material in the herbarium of the New York Botanical Garden and the Philadelphia Academy of Natural Sciences has been superficially examined. About 1300 measurements were made of involucre, ray-flowers, disk-flowers and other organs. It was found in the course of this work, as in the study of *A. lateriflorus*, that many of these measurements are of material aid in delineating groups, and especially in detecting hybrids. They are useful also in the determination of the parents of these crosses. The abundant overlapping of the measurements within such groups as *A. paniculatus* and *A. praealtus* has greatly strengthened the opinion that the varieties of these species treated below are really varieties and not species.

#### KEY TO THE SPECIES AND VARIETIES STUDIED

- a. Veinlets forming a conspicuous reticulum of fine nearly isodiametric areolae; lateral primary veins usually wanting; leaves subcoriaceous, with slightly revolute margins; rameal leaves spreading in most varieties: involucre bracts firm at base, often with loose spreading tips: spread of rays (15) 18–27 mm.: lobes of disk-corollas short, 17 to 25 per cent of the whole length of the limb.<sup>1</sup> . . . . b.
- b. Involucre bracts little imbricated, the tips commonly not plainly deltoid. . . . . c.
- c. Leaves glabrous beneath, glabrous or scabrous-puberulent above. . . . . d.
- d. Rameal leaves linear or linear-lanceolate or narrowly elliptic-lanceolate, very acute. . . . . e.
- e. Cauline and rameal leaves lanceolate to narrowly elliptic-lanceolate, the primary rameal about 6–10 times as long as broad. . . . . 1. *A. praealtus*.
- e. Cauline and rameal leaves linear or nearly so, the primary rameal about 11 times as long as broad. . . . .  
Var. *angustior*.

<sup>1</sup> The disk-corollas consist of tube and limb. The latter is composed of throat and lobes.



- d. Rameal leaves, at least the ultimate, broadly elliptic-lanceolate or oval, often obtuse.....Var. *subasper*.
- c. Leaves puberulent or scabrous on both surfaces: stems more puberulent.....Var. *nebraskensis*.
- b. Involucral bracts conspicuously imbricated in 3 to 6 series of different lengths.....f.
- f. Heads not racemose, rather scattered: rameal leaves linear-lanceolate, divaricate: involucral bracts in 3-4 series.....Var. *texicola*.
- f. Heads more crowded, usually more or less racemose on the branches: rameal leaves short, about 1 cm. long, linear-oblong, crowded, more ascending: involucral bracts in 4-6 series.....Var. *imbricator*.
- a. Veinlets not so evident or, if evident, with more irregular and more oblong areolae: leaves more succulent or membranous; the rameal usually flat, ascending or spreading: involucral bracts scarcely firm, sometimes thick, usually membranous, the tips rarely spreading.....g.
- g. Plant paniculate, often bushy, up to 2 m. high: involucre of rather narrow and thin or succulent bracts: upper leaves little or much reduced; cauline leaves scarcely or but slightly clasping, the midrib single or nearly so (see no. 2).....h.
- h. Heads of medium size: involucre (4) 4.5-8 mm. high: spread of rays 12-25 mm.....i.
- i. Corolla-lobes 19 to 36 per cent. of whole length of limb: involucral bracts subequal and the outer often herbaceous and loose or spreading, rarely much imbricated: leaves rather firm, at least the upper not narrowed at base: veins, except midrib, obscure.....j.
- j. Plant bushy, paniculate: heads numerous: involucre 5.5-7.5 mm. high: ray-corollas 8-12 mm. long: leaves linear or narrowly lanceolate; the rameal much reduced, scarcely or but slightly clasping.....2. *A. coerulescens*
- j. Plant less bushy and more corymbose-paniculate: heads somewhat larger and fuller: involucre 7-8 mm. high: ray-corollas 13-16 mm. long: leaves slightly broader; the rameal little reduced, more clasping.....Var. *Wootonii*.
- i. Corolla-lobes 30 to 45 per cent. of the length of the limb: involucral bracts unequal and imbricated: leaves less firm and often more veiny, nearly all narrowed at base.....k.
- k. Leaves linear or nearly so, 12 times as long as broad or longer.....3. *A. paniculatus*.
- k. Leaves lanceolate, less than 12 times as long as broad.....Var. *simplex*.
- h. Heads smaller: involucre 3.3-4.5 mm. high (rarely 5 mm. in no. 4): spread of rays 10-16 mm.: lobes of disk-corollas 30 to 45 per cent. of length of limb.....l.
- l. Heads loosely paniculate, rather few: rameal leaves soft, scarcely sharp-pointed: plant small for the group, 1.5-6 dm. high: leaves 3-10 cm. long, rather soft, usually entire: north-eastern.....4. *A. saxatilis*.



l. Heads subracemose on the branches, very numerous on well developed plants: rameal leaves very numerous, rather firm and sharp-pointed: plant coarser, up to 1.5 m. high: leaves firmer, often 15 cm. long, often serrate: central-western.....5.

*A. interior.*

g. Plant with a rather small subcorymbose panicle, rarely over 8 dm. high: involucre of firmer and often broader, more imbricated bracts often with pale midribs: upper leaves little reduced, generally clasping; cauline leaves rather thick, slightly clasping, pale, often with whitish veins, midrib usually doubly or triply nerved: corolla-lobes 18 to 28 per cent. of length of limb.....6.

*A. laetevirens.*

1. *A. PRAEALTUS* Poir. Encyc. Suppl. i. 493 (1810). *A. salicifolius* Ait. Hort. Kew iii. 203 (1789) not Lam.?.; Gray Synopt. Fl. N. A. 1<sup>2</sup>. 188 (1884) and Rob. & Fern. in Gray, Man. ed. 7: 812 (1908), in part the vars.; Britton & Brown Ill. Fl. N. S. and Can. iii. 377 (1898), in part. *A. rigidulus* Desf. Cat. 122 (1815). *A. obliquus* Nees, Gen. et Sp. Aster, 76 (1833). *A. carneus* T. & G. Fl. N. A. ii. 133 (1841), in part at least; Gray, Man. eds. 1 to 5 but doubtfully Nees, Synop. Ast. 27 (1818) and Gen. et Sp. Ast. 96 (1833). *A. hesperius* Gray, Synopt. Fl. 1<sup>2</sup>. 192 (1884), in small part.—Stems 4–18 dm. high, rarely higher, glabrous below, pubescent in lines above, or the pubescence almost completely encircling the stem, often brownish or purplish, densely and paniculately branched in the upper part; branches ascending or spreading, very leafy: leaves subcoriaceous, slightly revolute, glossy, smooth, scabrous or scabrous-puberulent above and usually rugose, glabrous beneath; margins entire, scabrous; veinlets conspicuously reticulated especially beneath; primary veins from the simple midrib not evident except in the largest leaves; areolae of the reticulum as wide as long; cauline leaves lanceolate or elliptic-lanceolate, very acute, mostly 7–13 cm. long and 8–18 mm. wide; primary rameal leaves narrowly lanceolate, very acute, 2–4.5 (6) cm. long, 6 to 10 times as long as wide; ultimate rameal leaves similar but smaller: heads of medium size (disk 6–10 mm. broad), numerous, racemose toward ends of branches, forming a large broad panicle; the short peduncles irregularly foliose-bracted: involucre 5–7 mm. high; bracts firm, in 3–4 successively shorter series, none normally foliaceous but sometimes with loose tips, oblong-lanceolate or linear-lanceolate, 0.6–1 mm. wide, very acute, glabrous or sparingly erose-ciliate, pale at margin and base, the slender green midrib narrowly rhombic-dilated above: rays 20–35; the corollas 6–15 mm. long, 0.8–1.6 mm. wide, bluish-purple, rarely white: disk-corollas narrowly funnel-form or tubular; the erect or ascending lobes very short (0.5–0.9 mm. long), only 17 to 25 per cent of the length of the whole limb: pappus-hairs 40–60, each 4.5–7 mm. long: achenes about 2 mm. long, more or less hairy.—Low ground: Kentucky, Ohio and Michigan to Wisconsin (?), Kansas, Arkansas, Texas, New Mexico, Arizona and northern Mexico;



apparently fairly common in Illinois and adjacent states. Some specimens examined: KENTUCKY: *Short* (2 specimens). OHIO: *Riddell*, also *Sullivant* (T. & G. specimens). MICHIGAN: Detroit, 1900, *O. A. Farwell*, no. 871. INDIANA: Wells County, 1913, *C. C. Deam*, no. 14145. ILLINOIS: *J. Wolf*, nos. 175, 188, 189, also *E. Hall*; Carlinville, 1890, *W. E. Andrews*, no. 16; Ringwood, 1862, *Vasey*; Sidney, 1914, *A. S. Pease*, no. 16335; Larchmound, 1914, *R. Ridgway*, no. 69; Fountaindale, 1872, *M. S. Bebb*; Peoria, 1904, 1906, *F. E. McDonald*. IOWA: Ames, 1877, *J. C. Arthur*. MISSOURI: St. Louis, 1832, *Drummond*; Dodson, 1906, *B. F. Bush*, no. 4151; Jackson County, 1893, *Bush*, no. 159. ARKANSAS: *F. L. Harvey*, no. 29. KANSAS: Atchison County, 1895, *A. S. Hitchcock*, no. 989. OKLAHOMA: Tulsa, 1913, *G. W. Stevens*, no. 2977; Fisher, 1913, *Stevens*, no. 2966. TEXAS: Dallas, 1874, *J. Reverchon*; Fredericksburg, 1850, *G. Thurber*, no. 61. MEXICO: near Chihuahua, 1885, *C. G. Pringle*, no. 288 in part, but involucre peculiar. NEW MEXICO ? 1851, *C. Wright*. ARIZONA: near Ft. Huachuca, 1882, *Lemmon*, no. 2906 (not quite typical, labelled "*Aster hesperius* n. sp." by Gray); Wilgus Ranch, Chiricahua Mts., 1907, *J. C. Blumer*, no. 1774; Barbacamori, 1851, *C. Wright*, no. 1159 (possibly a hybrid; labelled "*A. hesperius* n. sp." by Gray). One specimen is from Stony Brook, Jamaica Plain, MASSACHUSETTS (1887, *E. & C. E. Faxon*, no. 21), but this may have been introduced there, as also may have been specimens labelled "Georgia, *P. V. LeRoy*" and "Byram, N. J., *H. L. Fisher*."

The name adopted for this species by Torrey & Gray was *A. carneus* Nees. This name was used in the various editions of Gray's Manual up to and including the fifth, and was the one employed in Wood's Class-Book of Botany. In the Synoptical Flora, Dr. Gray substituted the name *A. salicifolius* Ait. (Lam.?) since which time this has been the accepted name. Lamarck's *A. salicifolius* is, however, practically unidentifiable. Dr. Gray in his studies of types abroad found no specimen so named by Lamarck and Prof. Lecomte has stated to the writer that apparently no type specimen exists in the Lamarck herbarium. The original description does not strongly suggest the present species. The leaves are described as "serrates,—glabres et bordes de dents aigues un peu distants," while those of the species in question are entire or nearly so. It would seem desirable to drop the Lamarckian name as impossible of definition. In 1789 Aiton proposed an *A. salicifolius* independently. An excellent photograph of the type specimen in this case has been kindly supplied the writer by Mr. Ramsbottom and it is clearly a photograph of the present species, an interpretation supported by a few florets from the type which show the short corolla-lobes and long throat characteristic of this species.



The International Congress at Cambridge in 1930 voted to reject homonyms with the sentiment in favor of such rejection even if the first used name is simply undefinable. It would seem best therefore to give up the name *A. salicifolius* entirely.

In 1810 Poiret proposed the name *A. praealtus*, basing it entirely on Aiton's *A. salicifolius*, it being essentially a renaming of that species. This name therefore is referable unquestionably to our plant. However, several names were proposed before Poiret's for plants of this general group of Asters. A study of these names seems to indicate that none clearly apply to the present species. These names doubtfully relating to it may be briefly discussed: *A. salignus* Willd. (Sp. Pl. iii. 2040, 1804), as now occurring in Europe, resembles *A. praealtus* superficially and has short corolla-lobes, but it has larger heads, looser involucre, subdentate leaves, and much coarser vein-reticulations. In general character the leaves are more like those of the *A. puniceus* group. *A. bellidiflorus* Willd. (Enum. Hort. Berol. 886, 1809) has been generally referred to *A. paniculatus*, but some of the old European garden specimens in the Gray Herbarium are nearly *A. praealtus*. The mention of subclasping leaves and loose involucre suggests *A. salignus*, from which Nees says Willdenow differentiated it, or *A. puniceus*, and not *A. paniculatus* (rays white) nor scarcely *A. praealtus*. It was very likely a garden hybrid. *A. eminens* Willd. (Enum. Hort. Berol. 886, 1809) was referred by Dr. Gray in his study of types to *A. salicifolius* and in the Synoptical Flora to *A. salicifolius* or *A. paniculatus*. Nees, however, made it a synonym of *A. junceus* Ait. and *A. longifolius* Lam. In the original description the involucre is described as loose, which would scarcely apply to *A. salicifolius* or *A. paniculatus* but the height given is five feet which is scarcely if ever attained by *A. junceus* or *A. longifolius*. The subserrate leaves and 1-flowered branches are not characters of *A. salicifolius*. This plant also was most probably a garden hybrid.

In recent years there has been great confusion in the application of the name *A. salicifolius* (*praealtus*) to herbarium specimens, and the extension of the range to the east by many authors has been largely based on specimens of *A. paniculatus* var. *simplex* incorrectly named. *A. praealtus* may be readily distinguished from *A. paniculatus*, however, by the shallow corolla-lobes and thicker more noticeably and more finely reticulated leaves.

Just how *A. praealtus* came into European gardens so early (1760



by P. Miller according to Aiton, probably earlier) is not clear. No form of this species grows near the Atlantic seaboard except in the Boston and New Orleans regions. The European specimens do not greatly resemble the var. *angustior*, the only form that occurs near Boston. French missionaries, however, may have brought back plants from the interior.

Var. **angustior**, var. nov., foliis longioribus et angustioribus, linearibus vel lineari-lanceolatis, 11-plo longioribus quam latis.

Leaves longer and narrower than in the typical form of the species, linear or linear-lanceolate, about 11 times as long as broad, the long narrow usually spreading rameal leaves particularly striking: involucre and pappus tending to be shorter than in the typical form of the species.—Rich low open woods or banks: "Oak Island," Revere Beach, near Boston, Massachusetts; also Indiana and Illinois. Specimens examined: MASSACHUSETTS: "Chelsea Beach Island" [Oak Island], 1850, *W. Boott* (TYPE in Gray Herb.); Oak Island, Revere, 1878, *H. A. Young*, 1883, *E. Faxon*, 1894, *G. G. Kennedy*. INDIANA: Mt. Vernon, Posey Co., 1920, *C. C. Deam*, no. 33,064. ILLINOIS: Fountaindale, 1872, *M. S. Bebb*.

The distribution of this plant is interesting. It is another western plant finding an isolated eastern station on Oak Island,<sup>1</sup> Revere Beach, along with *Eupatorium falcatum* Michx. and several others.

Lindley's *A. stenophyllus*<sup>2</sup> was referred to this species by Dr. Gray, and accepted by Burgess<sup>3</sup> (as a variety) for narrow-leaved forms. There is much doubt as to whether Lindley had any form of *A. praealtus* in mind. His description calls for a plant with spreading branches densely racemose at apex, secund heads, inner involucre bracts with colored tips and rays pale flesh-colored. It is placed in a group with *A. hirsuticaulis* Lindl., *A. diffusus* Ait., *A. miser* L., and *A. pendulus* Ait., and very likely belonged to the *A. lateriflorus* group. Burgess also apparently had some other plant in mind, as the range given by him was much to the southward. It seems scarcely wise therefore to employ the name, var. *stenophyllus*, for the present variety.

Var. **subasper** (Lindley), comb. nov. *A. subasper* Lindl. in Hooker's Comp. Bot. Mag. i. 97 (1835), also in DC. Prodr. v. 237 (1836). *A. carneus*  $\beta$ . *subasper* T. & G. Fl. N. A. ii. 133 (1841), in part. *A. salicifolius* var. *subasper* A. Gray, Synopt. Fl. i.<sup>2</sup> 188 (1884) and Robinson & Fernald in Gray, Man. ed. 7, in large part.—Leaves generally more scabrous than in the typical form; rameal leaves, or at least the ulti-

<sup>1</sup> For an account of Oak Island see W. P. Rich, "Oak Island and its Flora." RHODORA iv. 87 (1902).

<sup>2</sup> In DC. Prodr. v. 242 (1836).

<sup>3</sup> In Britton & Brown, Ill. Fl. N. S. and Can. iii. 377 (1898).



mate, broad, only 2–5 times as long as wide, merely acutish, with often truncate or somewhat clasping base: bracts of the involucre generally broader, (0.8) 1–1.5 mm. wide.—Illinois and Texas. “Foliage not shining, grows in very low ground in dense clusters, . . . bogs” (*J. Wolf*). Specimens examined: INDIANA: *Dr. Clapp*. ILLINOIS: Canton, 1881?, *J. Wolf*, nos. 205 and 110, 1893 *Wolf*, nos. 26 and 32; Carlinville, 1892, *W. E. Andrews*, no. 9a. TEXAS: “4–6 feet high, branching above in large dense patches, on swampy places of the mountain streamlets, on the Liano,” 1845–48, *F. Lindheimer*, nos. 456, 625 and b254.

Lindley's *A. subasper* seems to have been based on the scabrous character, but Dr. Gray mentions also the broader rameal leaves and involucre bracts. These two latter characters seem more important and more constant than the degree of roughness. More emphasis placed on the breadth of bract has resulted in the transfer of a few specimens labelled “var. *subasper*” by Gray to the typical form.

Var. **nebraskensis** (Britton), comb. nov. *A. nebraskensis* Britton in Britton & Brown's Ill. Fl. N. S. & Can. iii. 375 (1898).—Stem more pubescent: leaves scabrous or puberulent on both surfaces, averaging broader: heads rather large: involucre bracts strongly ciliate, often puberulent, usually broader.—Nebraska. Specimens examined: NEBRASKA: “Valley of the Lower Platte,” 1842, *Fremont Exped.*: Burwell, 1907, *J. M. Bates*; Ainsworth, 1897, *Bates*; Callaway, 1900, *Bates*, no. 2603; Whitman, 1893, *P. A. Rydberg*, no. 1724, duplicate type.

The taxonomic status of this variety is not very clear. The Rydberg specimen has very broad rameal leaves and rather broad bracts as in var. *subasper*, while the leaves and involucre bracts of the other specimens approach those of typical *A. praealtus*. The foliage seems a little coarser than in *A. praealtus*. The involucre bracts are apparently a little less unequal, and possibly in fewer series, than in the typical form and var. *subasper*.

Var. **texicola**, var. nov. Bracteis involucri vere imbricatis exterioribus seriatim brevioribus, capitulis non racemosis laxis submagnis, foliis ramorum lineari-lanceolatis divaricatis laxis.

Similar in habit and foliage to the typical form but more open and diffuse: rameal leaves rather short, linear-lanceolate, spreading, not crowded: heads slightly larger and more loosely arranged, less racemose: involucre bracts more imbricated, in 3–4 successively shorter series, rather broad (about 1 mm.), with subdeltoid tips, broadly green with narrow or obsolete scarious margins.—Kansas and Texas. Specimens examined: KANSAS: Univ. Campus, Lawrence, 1902, *M. A. Barber*, apparently this. TEXAS: “Under shrubs on the rocky banks of the upper Pterdenales” [Pterdenales River, Gillespie Co?] 1845, *F. Lind-*



*heimer*, no. 445; "3-5 ft. high, banks of streams," Comanche Spring, 1849, *Lindheimer*, nos. 186b, and 881 (TYPE in Gray Herb.); Dallas, 1880, *J. Reverchon*, no. 40.

The heads in this variety are larger than in any other form of the species except possibly var. *nebraskensis*.

Var. **imbricator**, var. nov. Bracteis involucri valde imbricatis latis exterioribus seriatim brevioribus, capitulis plus minusve confertis racemosisque, foliis ramorum 1 cm. longis sublatis confertis.

Involucre more obconic than in the last variety; bracts much imbricated in 4-6 successively shorter series, passing into the rameal leaves: heads more racemose and more crowded: rameal leaves about 1 cm. long, rather broad, crowded.—Missouri to Texas. Specimens examined: MISSOURI: near Springfield, 1890, *S. Weller*. ARKANSAS: *Dr. Woodhouse*. TEXAS: New Braunfels, 1851, *F. Lindheimer*, nos. 636 and 883; College Station, 1896, *H. Ness*. (TYPE in Herb. Cornell Univ.)

This variety has the appearance of a hybrid of *A. pracaltus* and *A. lateriflorus* var. *pendulus*, but the specimens are rather uniform and extreme. The var. *pendulus* is apparently rare in Texas. It probably occurs in the eastern part of the state, but the writer has seen no certain specimens from there.

2. *A. COERULESCENS* DC. Prod. v. 235 (1836). *A. salicifolius* var. *caerulescens* Gray, Synopt. Fl. N. A. i<sup>2</sup> 188 (1884), in part at least. *A. hesperius* Gray, l. c. 192 (1884), in large part. *A. fluvialis* Osterhout, Bull. Torr. Bot. Club. xxxii. 611 (1905). *A. fluvialis* Rydb. Fl. Rocky Mts. 886 (1922). *A. lautus* Lunell, Amer. Mid. Nat. ii. 146 (1911). *A. durus* Lunell, l. c. ii. 148 (1911). *A. lautus* var. *prinoides* Lunell, l. c. v. 55 (1917). *A. paniculatus* var. *polychrous* Lunell, l. c. v. 55 (1917).—Stem tall, up to 1.5 m. high, much branched above in the larger plants and bushy, glabrous below, more or less striate or angled and pubescent in lines above; branches ascending or spreading: leaves linear or narrowly lanceolate, thick and obscurely veined, 6-15 cm. long, 5-15 mm. broad, very acute, tapering to a scarcely auriculate base, glabrous and smooth or sparingly scabrous above, scarcely rugose, glabrous beneath; margin entire or with a few low teeth, scabrous; midrib pale, sometimes accompanied by two indistinct parallel adjacent more slender veins, and often with a few strongly ascending branches; areolae irregular, inconspicuous, mostly longer than broad; rameal leaves much smaller, narrowly lanceolate, ascending, slightly if at all clasping, scabrous margined, often falcate on the more diffusely branched plants: heads numerous, in a large panicle, rarely at all racemose, mostly short peduncled and rather crowded: involucre 5.5-7.5 mm. high; bracts rather thin, narrow, lanceolate or linear-lanceolate, 0.7-1.0 mm. broad, gradually acute, in 2-4 nearly equal series, or the outer sometime shorter and more



imbricated, usually somewhat foliaceous and loose and often with slightly spreading tips, more or less ciliate-erose, otherwise usually glabrous; margins and base of the inner bracts mostly pale, the fine green midrib gradually dilated above: rays 23–34, rarely more, white or purple; the corollas rather long, (8) 10–12 mm. in length, 0.8–1.5 mm. broad: disk corollas narrowly funnelform or tubular; the erect or ascending short lobes 0.6–1.1 mm. long, 19–36 per cent of the length of the whole limb: pappus hairs 45–60, each 5–6 mm. long: achenes about 2 mm. long, hairy.—Damp soil along rivers and irrigation ditches: Wisconsin and Alberta to Central Nebraska and Wyoming (Nelson), southward through central Kansas and the mountain foothills to central Texas, northern Mexico, Arizona, Utah and southern California. Some specimens examined: ALBERTA: 1906, *Macoun*. WISCONSIN: St. Croix Falls, *C. F. Baker* (probably this). NORTH DAKOTA: Leeds, 1910–16, *J. Lunell*, nos. 1085, 1086, 1087, 1091. NEBRASKA: Long Pine, 1896, *J. M. Bates*; Red Cloud, 1909, *Bates*; Wood River, 1910, *Bates*. KANSAS: Riley County, 1895, *A. S. Hitchcock*, no. 726. OKLAHOMA: Tishomingo, 1915, *H. W. Houghton*, as Stevens no. 3508. COLORADO: Platte River, 1910, *A. Eastwood*, no. 74; New Windsor, 1897–98, *G. E. Osterhout*, no. 8, 1899, *Osterhout*, no. 4, 5 & 7, 1905, *Osterhout*, no. 3188. TEXAS: *Berlandier*, no. 510 (duplicate type of DC.); Weatherford, 1902, *S. M. Tracy*, no. 8133. UTAH: Hurricane, 1918, *W. W. Eggleston*, no. 14840. ARIZONA: near Ft. Huachuca, 1882, *Lemmon*, no. 2905; Black River Flats, *J. T. Rothrock*, no. 789, not typical. CHIHUAHUA: Colonia Garcia, 1899, *Townsend & Barber*, no. 346, probably, undeveloped. CALIFORNIA: San Diego County, 1874, *D. Cleveland*; San Bernardino Valley, *S. B. Parish*, nos. 564, 572, 3818; San Jacinto Mts., 1880, *Parish Brothers*, no. 526; Ft. Tejon, 1864, *Dr. Horn*; Walker's Basin, Kern County, 1875, *J. T. Rothrock*, no. 283; Tehachapi, Kern County, *Brandege*.

The oldest name for this plant is apparently *A. coerulescens* DC. A duplicate of the type is in the Gray Herbarium and belongs clearly to the present species, not to *A. salicifolius* as stated by Dr. Gray. Judging from specimens labelled by Dr. Gray, his *A. salicifolius* var. *caerulescens* was a mixture of several forms, and apparently was not well understood. Two of these specimens are here referred to *A. praealtus* var. *texicola*, one is related to *A. ericoides*, and two others belong to the present species, one of these being the duplicate type. Specimens labelled "*A. hesperius* n. sp." by Gray indicate that this latter species was based partly on *A. praealtus* and partly on specimens of *A. coerulescens*. The specimens cited from North Dakota in the present paper are all type specimens of the various Lunell synonyms listed above, and are all in the herbarium of the University of Minnesota. They are not unlike the general run of specimens of this species.



Var. **Wootonii** (Greene), comb. nov. *A. hesperius* var. *Wootonii* Greene, Bull. Tor. Bot. Club. xxv. 119 (1898). *A. Wootonii* Greene, Leaflets, i. 146 (1905).—Heads rather large, the involucre 7–8 mm. high, and ray corollas up to 16 mm. long: inflorescence a little more corymbose: stems less branched: rameal leaves much less reduced, broader and more clasping at base.—“Wet ground especially along streams in the Transition Zone” (Wooton & Standley): mountains of New Mexico and Arizona and possibly southern California. Specimens examined: NEW MEXICO: *Rose & Fitch*, no. 15780; Mogollon Mts., 1881, *H. H. Rusby*, 191; White Mts., 1897, *E. O. Wooton*, no. 329 (duplicate of type of var. *Wootonii* Greene). CALIFORNIA: Tehachapi, *Mrs. Brandegee*, probably this; San Antonio Mts., 1917, *I. M. Johnston*, no. 1427, not typical; San Bernardino Mts., 1884, *S. B. Parish*, no. 1691, probably.

The status of this variety is not clear. In the present study insufficient material was at hand to give a clear picture. Its aspect sometimes approaches that of *A. laetevirens*, but the involucre is like that of *A. coerulescens*. The southwestern forms of *A. praealtus* seem to have been mistaken for this variety at times. It probably occurs in southern California, but the specimens seen from that region are transitional to the typical form. Rydberg<sup>1</sup> has noted that Wooton's no. 329, which represents the type collection of var. *Wootonii* Greene, and Baker's no. 817, cited by Greene as typical of his *A. Wootonii*, are not the same. Duplicates of these numbers seen by the writer indicate that they are not. Wooton's specimen is an immature rather untypical plant apparently of this variety, while Baker's specimen seems to be a diffuse form of *A. laetevirens*.

3. *A. PANICULATUS* Lam. Encyc. i. 306 (1783); Gray, Synopt. Fl. N. A. i<sup>2</sup>. 187 (1884) in part; Gray, Man. ed. 6 and 7, in large part. *A. tenuifolius* T. & G. Fl. N. A. ii. 132 (1841), in part at least, not L., and Gray, Man. eds. 1–5. *A. tenuifolius*  $\beta$  *ramosissimus* T. & G. l. c. (1841), the more divaricate-branched plants. *A. tenuifolius*  $\gamma$  *bellidiflorus* T. & G. l. c., the more strict plants chiefly, doubtfully *A. bellidiflorus* Willd. Including *A. paniculatus* var. *bellidiflorus* Burgess in Britton & Brown, Ill. Fl. No. Sta. and Can. iii. 377 (1898) and Gray, Man. ed. 7, largely, except perhaps as to range.—Stems 5–15 dm. high, rather strict or sometimes diffuse, glabrous below, pubescent in lines above and usually with greenish striae; branches ascending or sometimes widely spreading: middle cauline leaves narrow, linear or nearly so, 8–15 cm. long, 3–12 mm. wide, 12 times as long as broad or narrower, mostly spreading, tapering to an acute apex and non-clasping base, rather firm but not coriaceous, glabrous and smooth on both surfaces or scabrous above toward the tip, not at all rugose;

<sup>1</sup> Bull. Torr. Bot. Club xxxvii. 140 (1910).



margins usually flat, scabrous-ciliolate, more or less serrate in the larger leaves, rarely entire; primary branch-veins few, not conspicuous, the ultimate areoles irregular, mostly longer than broad, usually indistinct; rameal leaves lanceolate to nearly subulate, ascending or more rarely spreading, rather stiff, their margins scabrous-ciliolate: heads of medium size (disk 6–8 mm. broad), paniculate, rarely at all racemose and then not unilaterally disposed; involucre (4) 4.5–5.5 mm. high; bracts narrow, linear-subulate, linear, or narrowly oblong, acutish, glabrous or sparingly ciliolate, rather firm but not coriaceous with green midrib and apex, well imbricated, usually even the tips appressed: ray corollas 20–40, each 6 to 11 mm. long, white, very rarely tinged with blue or lavender: disk corollas narrowly funnel-form or tubular; lobes moderately deep, 0.7–0.9 (1.2) mm. long, 30 to 45 per cent of the length of the whole limb, usually spreading, rarely at all recurved: pappus hairs (32) 40–65 (80), each 3.6–6 mm. long: achenes narrowly obovoid, somewhat flattened, strigose, about 2 mm. long.—Meadows, low thickets and shores: New Brunswick, Nova Scotia, Maine, and central Quebec to Connecticut and the highlands of New Jersey and eastern Pennsylvania, westward through Ontario and Ohio to Wisconsin and Missouri; common in Canada and northern New England, frequent in northern New York but rare elsewhere in the state, rare in northern Ohio and northern Illinois. A strict specimen from Missouri (Courtney, *Bush*, no. 1785) is apparently to be referred to this form of the species. The habit varies greatly. Forms with strict branches and rameal leaves have been segregated as var. *bellidiflorus*, and were so segregated in the present study during its earlier stages. A closer inspection, and a tabulation of the flowering period as determined from the labels, has seemed to show, however, that these strict plants are for the most part juvenile stages of the more divaricate and diffuse types. It may be noted incidentally that nothing in the original description of *A. bellidiflorus* Willd. suggests this fastigiate habit, and why the name has been applied to this form is not clear. Plants with the heads somewhat smaller than usual occur rather frequently around the Great Lakes and westward, but in most cases these are to be interpreted as hybrids, or occasionally as due to crowding or poor nutrition.

This species can be distinguished from *A. praealtus* by the much deeper corolla-lobes, more ascending rameal leaves and non-rugose, softer, flatter, often more serrate cauline leaves with less conspicuous reticulum of the ultimate veinlets and more oblong veinlet areoles. The species seems to be largely an inhabitant of the heavier clay soils.

The oldest name previously applied to any member of this species concept is *A. Tradescanti* of Linnaeus. There has long been doubt, however, as to the application of this name. The matter has been discussed at some length by Dr. Gray and the synonymy worked out



by him as based on his extended study of types in the European herbaria.<sup>1</sup> Linnaeus's publication of *A. Tradescanti* was based on a two line description of little diagnostic value, and references to Hortus Cliffortianus, Hortus Upsaliensis, and Morison's Historia, the latter reference being the name-bringing citation. According to Gray, one of the two specimens in the Clifford herbarium is a small-headed form of the present species, the other being referable to *A. vimineus*. A specimen in the Linnean herbarium, from the Upsala garden, Gray says is the large headed *A. paniculatus*. A plant in the Morison herbarium, which according to Gray should probably be considered the type, is a small-headed form of the present species, and this is the form to which Dr. Gray would apply the Linnean name. A photograph of the Morison plant, taken by Professor Fernald, is in the Gray Herbarium. This photograph does not seem to match any American form unless it be a shade condition of some normally wild form. The specimen may have come from shaded or crowded colonies in the garden. The heads are rather small, but are not fully developed, and possibly would have been larger if they had matured. The rameal leaves are more elliptic, more lax, and less rigid than in all forms of this species, but resemble somewhat those of *A. saxatilis*. Indeed, the photograph suggests *A. saxatilis* very much in the panicle and rameal leaves, but the cauline leaves are more divaricate. There is, however, no reason to believe that the low and slender *A. saxatilis* was in cultivation in Europe at that early period. In the opinion of the writer, this Morison plant may very likely have been simply an undeveloped shaded individual of var. *simplex*, but we have no way of proving this. It may, however, have been a hybrid form of *A. paniculatus* with *A. lateriflorus* or *A. vimineus*. Dr. Gray applied the name to a race of small-headed, paniculate plants which he gave as ranging from "Canada to Virginia, Illinois, and Saskatchewan. Cultivated from the earliest days in European gardens." After vain attempts during the present study to establish such a species, the writer is now of the opinion that no such race exists in the wild state in America and probably nowhere in cultivation. The older European specimens bearing this name in the Gray Herbarium are apparently hybrids of *A. lateriflorus* with *A. paniculatus* or *A. praealtus*. In America, the specimens labelled *A. Tradescanti* by Dr. Gray, and

<sup>1</sup> Proc. Amer. Acad. Arts and Sci. xvii. 166 (1882), and Synopt. Fl. N. A. 1<sup>o</sup>. 187 (1884).



those in the New York Botanical Garden Herbarium that served as a basis for Dr. Britton's, and in part for Mr. Burgess's treatment in the two editions of the Illustrated Flora, may be interpreted as hybrids with *A. lateriflorus*, *A. vimineus*, *A. missouriensis* var. *thyrsoideus*, *A. interior*, and *A. ericoides*, or in a few cases as straight *A. lateriflorus* or straight *A. vimineus*, or in some cases as simply undeveloped *A. paniculatus*. It seems impossible to detect a definite race among all these specimens. The mass of specimens is conspicuously marked by lack of uniformity. Because of this extremely vague and indefinite status of the name the writer believes that the best interests of taxonomy are served by abandoning it altogether.

The next oldest name is *A. paniculatus* Lam. The interpretation of this also is not easy. Prof. Lecomte writes that no type specimen exists in the Lamarck herbarium. Dr. Gray in his study of types says: "The proper herbarium of Lamarck at Rostock I have not been able to consult. But distinct traces of all the species, with one exception [*A. salicifolius*], have been found at Paris," and farther on: "A common and multiform northern species, the *A. Tradescanti* L., as to herb. and Hort. Ups. (but not of Morison), comprising *A. tenuifolius* and *A. simplex* of Torr. and Gray, Flora, mainly, exc. syn." From this it may be judged that he saw traces of this at Paris. In the Synoptical Flora Gray says: "Lam. Dict. i. 306 (1783, the char. not good for the involucre, but it is the *A. serotinus procerior*, & c., Tourn., cited by Lam.)." The original description is not very convincing and it is difficult to make much out of it. However, in view of Dr. Gray's rather positive statements concerning the identity of the name and the lack of further evidence as to what it might otherwise be, and in view of the long continued use of the name since Gray's time, it may well be retained for this species. Lamarck's statement that the leaves are narrowly lanceolate may be assumed to refer it to the narrow-leaved form. Previous to the Synoptical Flora and beginning with Torrey & Gray or before, the narrow-leaved variant here considered the typical form was usually called *A. tenuifolius* L. and the broad-leaved type *A. simplex* Willd.

The species is highly variable in many of its organs, apparently for the most part in response to the environment, but the writer has been unable to draw any specific lines within this general *A. paniculatus* complex. The plants differ only in general habit, width of leaves, and other superficial and variable characters, while the essentials of floral



and head structure remain the same. Many of these variants can often be found in the same field. Frequent intergrading specimens occur that unite the various trends in a perplexing way. The color of the rays, too, varies from pure white, the usual color, to lavender or pale blue in response apparently to some physiological or genetical disturbance about which we know little at present. Occasionally the color is due to hybridity, as shown by other characters. Hybrids are apparently common between *A. paniculatus* and other species as already stated. Those with *A. lateriflorus* and *A. puniceus* seem especially abundant in the east. Farther westward plants appearing to be crosses with *A. praealtus* and *A. missouriensis* var. *thyrsoides* are frequent. Less common hybrids with other species occur. Among all these variants only the broad leaved form seems to be worthy of nomenclatural recognition. This may be a true race as its range does not wholly coincide with that of typical *A. paniculatus*. It is here recognized as follows:

Var. SIMPLEX (Willd.) Burgess in Britton & Brown, Ill. Fl. No. Sta. & Can. iii. 377 (1898), chiefly this, as also Robins. & Fern. in Gray, Man. ed. 7. *A. simplex* Willd. Enum. Hort. Berol. 887 (1809), this or *A. salignus*; Nees, Gen. et Sp. Aster, 91 (1833); Torr. & Gray, Fl. N. A. and Gray, Man. eds. 1-5. *A. paniculatus* of Gray, Synopt. Fl. in part, also of Gray, Man. ed. 7 in part, and Burgess l. c. in part. *A. Jacobaeus* Lunell, Amer. Mid. Nat. v. 56 (1917).—Leaves broader, 10-40 mm. wide, 11 times as long as broad or wider: involucre bracts averaging slightly wider.—A more southern and western variant: New Brunswick and southern Quebec to Virginia and West Virginia, or possibly to the mountains of North Carolina; westward to South Dakota, Nebraska and Missouri and perhaps Texas. The common and almost exclusive form in central New York, rare in Canada and northern New England. Strict individuals are more common in the northeast. Rather late flowering, from Aug. 20 to Oct. 15, chiefly in late September and early October. Second growth specimens of this variety, from cut-off or injured stems, or late flowering specimens from other causes, often have the heads more bunched in the axils of the large leaves and the involucre bracts broader.

There is some doubt as to the proper varietal name for this form. Apparently no previous author has had exactly the same conception as here adopted. Burgess' conception verges toward the second growth type mentioned above. He may have included specimens of the common hybrid *A. puniceus* × *A. paniculatus*, suggested by his words "inflorescence leafy," or this latter phrase may have reference merely to the condition found in many second growth specimens.



Robinson & Fernald's conception seems to have been nearly that of Burgess. The conception in Torrey & Gray's *Flora* and in Nees von Essenbeck's revision is very nearly ours. Dr. Gray in his study of types refers *A. simplex* Willd. to *A. salignus* Willd., and in the *Synoptical Flora* this latter, along with *A. simplex*, to *A. salicifolius* Scholler [not *A. salicifolius* Ait.] which he says: "represents a form of this same species [*A. paniculatus*] either very early naturalized in Hungary and Germany or possibly indigenous." *A. salignus*, as represented by the few specimens seen by the writer, all modern specimens from various parts of Europe, does seem somewhat different from any form of *A. paniculatus*. Its heads are large and the rays often colored, the involucre loose, frequently of more equal bracts, and the leaves more clasping, though not strongly so. Willdenow's original description is very good for our form except in the statement "calycibus laxe imbricatis" and in another part of the description "calyx imbricatus, squamis lineari-subulatis adpressis inferioribus subpatulis." He may have had *A. salignus* in mind or he may have had plants of the present variety. However, considering the long continued use of the name *A. simplex* for broad leaved forms of *A. paniculatus* it would seem justifiable to continue its use in that sense, since it can not be definitely shown to be something else.

Several varieties of *A. paniculatus* recognized in recent years require comment. Var. *bellidiflorus* (Willd.) Burgess has been discussed above, and its doubtful validity pointed out. Also the difficulty in interpreting Willdenow's *A. bellidiflorus* has been noted. Most of the herbarium specimens passing as var. *bellidiflorus* have been interpreted by the writer as *A. paniculatus*, a few only having broader leaves and thus belonging to var. *simplex*. The two hairy varieties proposed by Fernald seem to have been of hybrid origin. The var. *cinerascens*,<sup>1</sup> as represented by the cited Veazie specimen, has every appearance of a hybrid of *A. paniculatus* and *A. undulatus* L. The type specimen of var. *lanatus*<sup>2</sup> (Punk Island, Lake Winnepeg, J. M. Macoun) strongly suggests a hybrid of *A. paniculatus* or possibly *A. interior* with *A. puniceus* L. *A. paniculatus* var. *acutidens* Burgess<sup>3</sup> seems to have been a mixture as treated by Burgess and also by other authors. Judging from specimens so named it has been made up of hybrids of *A. paniculatus* and *A. puniceus*, which often have large

<sup>1</sup> RHODORA i. 188 (1899).

<sup>2</sup> RHODORA vi. 131 (1904).

<sup>3</sup> Britton and Brown, Ill. Fl. No. Sta. & Can. iii. 378 (1898).



teeth, hybrids of *A. missouriensis* var. *thyrsoides* with *A. paniculatus*, and unusually large-toothed specimens of *A. paniculatus*. It does not seem to constitute a race.

4. *A. SAXATILIS* (Fernald) Blanchard, Amer. Bot. vii. 27 (1904). *A. vimineus* var. *saxatilis* Fernald, RHODORA i. 188 (1899), Gray's Man. ed. 7. *A. Tradescanti* var. *saxatilis* House, Bull. N. Y. State Museum, nos. 243-244, p. 27 (1923).—Low, 1.5-6 dm. high, slender: stems greenish, glabrous or nearly so, branched above only: branches rather short, ascending-spreading: leaves rather thin, glabrous, usually ascending, 3-10 cm. long, linear or linear-lanceolate or narrowly elliptic-lanceolate, 9-13 times as long as wide or sometimes narrower, acute but scarcely acuminate, subentire, sparingly scabrous on the margin; rameal leaves not numerous, the upper distant and much reduced, linear-lanceolate, rather soft, usually divaricate, indistinctly scabrous or smooth: heads small, rather few in a small loose terminal non racemose panicle, or on rather long branchlets: involucre 3.3-4.5 (5) mm. high; bracts narrow, usually sparingly ciliate: ray corollas (14) 17-25 (27) in number, rather short, (4.3) 5-8.2 mm. long, white: disk corollas about 3.2 mm. long; the lobes 30 to 45 per cent of the length of the whole limb: pappus hairs 25-43 in number, rather short (2.5-3.5 mm. long): achenes about 1.5 or 1.8 mm. long, strigose.—Ledgy, gravelly, or sandy often moist banks and shores: southwestern Nova Scotia and southern Maine from Washington County to Oxford and Cumberland Counties, extending up the Penobscot River to the Katahdin region; also in southern and western Vermont. Flowering period July 20-Sept. 10, averaging rather earlier than related species. Some specimens examined: NOVA SCOTIA: above Bridgewater, 1921, *Fernald & Long*, no. 24639; Sandy Cove, 1920, *Fernald & Long* and others, no. 22762 and 22764; various places in Yarmouth County, 1920-1, *Fernald & Long* and others, nos. 22763, 22765, 24635, 24636, 24637, 24638, 24640. MAINE: Marshfield, 1916, *C. H. Knowlton*; Katahdin Basin, 1898, *E. D. Merrill*; Mattawamkeag, 1898, *Fernald*, no. 2682; Upper Stillwater, 1895, *Fernald*, no. 361 (TYPE of var. *saxatilis*); Veazie, 1908, *Fernald*, nos. 286 and 287; Orono, 1908, *Fernald*, no. 286, not typical; Fairfield, Somerset County, 1916, *Fernald & Long*, no. 14725; Madison, 1894, *Fernald*; Bowdoinham, 1921, *N. C. Fassett*, no. 104; Gilead, 1897, *K. Furbish*; Clinton, 1909, *R. C. Bean*; Winslow, 1898, *E. B. Chamberlain*, no. 763. VERMONT: Williston Gorge, Chittenden Co., 1899, *W. W. Eggleston*.

This plant was first described as a variety of *A. vimineus*. Typical specimens show a relationship to this species only in the small heads and rather soft rameal leaves. It differs in the less branched habit, shorter and more ascending branches confined more to the upper part of the plant, more ascending leaves, non racemose long-peduncled heads, longer involucre (3.5-4.0 mm. instead of 3.0-3.6 mm.), and



longer ray corollas (5–8 mm. instead of 3–5.8 mm.). Its affinity seems to be with *A. paniculatus* but the plant is smaller, grows on drier soil, possibly flowers earlier, has leaves of a different shape and texture, smaller heads, fewer and generally shorter rays, and shorter pappus hairs. It seems to be a fairly good species.

5. **A. interior**, sp. nov. *A. carneus*  $\gamma$  *ambiguus* T. & G. Fl. N. A. 1<sup>2</sup> 133 (1841) or that a hybrid, not *A. ambiguus* Bernh. *A. Tradescanti* in part, and *A. paniculatus* in part, of Gray's Synopt. Fl. *A. Tradescanti* in part, of Gray's Man. ed. 7.

Caulibus ramosis inferiore parte glabris superiore in lineis pubescentibus, ramis adscendentibus vel patulis; foliis lanceolatis vel oblanceolatis vel fere linearibus 8–20-plo longioribus quam latis firmis non coriaceis planis subintegris scabrociliatis subtus glabris supra plus minusve scabris vix rugosis, venis plus minusve distinctis, areolis irregularibus laxis longioribus quam latis, foliis ramorum copiosis 1–3 cm. longis elliptico-lanceolatis subacutis; capitulis numerosissimis parvis subracemosopaniculatis vix secundis, involucri 3–4 mm. longis, bracteis angustis subglabris brevibus; ligulis 22–36 4.4–8.5 mm. longis albis vel purpureotinctis; lobis corollarum florum disci 30 ad 45 per centum totius limbi; capillis papporum 30–60 numero 2.8–4.5 mm. longis.

Plant of medium height, glabrous below, sparingly pubescent in lines above, much branched when well developed; branches ascending-spreading; leaves lanceolate, oblanceolate or nearly linear, 8–20 times as long as wide, firm but not coriaceous, mostly flat, more or less olive green when dry, entire or sparingly serrate, scabrous ciliate; lower surface glabrous and smooth; upper surface more or less scabrous, scarcely rugose; veins moderately distinct; areolae irregular, loose, chiefly longer than broad; lateral veins rarely developed; rameal leaves very abundant, 1–3 cm. long, elliptic-lanceolate, rather abruptly acute, not rigid; heads very numerous, small, on short branchlets, more or less racemosely paniculate on the branches, scarcely secund; involucre 3–4 mm. high, of narrow linear or oblanceolate, rather firm, imbricated, only moderately acute, nearly or quite glabrous or ciliate bracts, rather conspicuously shorter than the pappus: ray corollas 22–36 in number, 4.4–8.5 mm. long, lavender or white: disk corollas (2.6) 3.0–4.5 mm. long; lobes 0.6–0.9 mm. long, 30 to 45 per cent of the length of the whole limb: pappus hairs 30–60 in number, 2.8–4.5 mm. long; achenes as in other species.—Generally prairie country: Buffalo, New York, northern and western Ohio, southern Michigan, and Illinois; possibly also in central Wisconsin, Missouri and Louisiana. Specimens examined: NEW YORK: Buffalo, *G. W. Clinton*. OHIO: *Dr. Paddock* (type of *A. carneus* var. *ambiguus* T. & G.); Prairie of Ohio, *Riddell*. MICHIGAN: Detroit, 1900, *O. A. Farwell*, no. 1346; Botanic Garden, Mich. Agric. College, 1895, *C. F. Wheeler*. ILLINOIS: 1881, seven specimens, *J. Wolf*; Canton, 1893, *Wolf* (TYPE in Gray



Herb.); Peoria, *Dr. Stewart*. The specimens from Wisconsin, Missouri, and Louisiana are not typical and may be hybrids of this species with others, or hybrids of related species.

This seems to be a good species although it crosses freely with others. The small heads have frequently led to its confusion with the supposedly small-headed *A. Tradescanti*. The Paddock specimen on which the var. *ambiguus* T. & G. was based has rather more deeply lobed corollas and an aberrant look, and may be a hybrid with *A. lateriflorus*.

6. *A. LAETEVIRENS* Greene, *Pittonia*, iv. 219 (1900). *A. Osterhoutii* Rydb. *Bull. Torr. Bot. Club* xxxi. 654 (1904).—Stem rather low, 3–8 dm. high, glabrous below, pubescent in lines above, often purplish, usually simple or subsimple, terminating in a generally subcorymbose panicle which is small for the group; its branches 5–8 (15) cm. long, ascending: leaves thick but not coriaceous, rarely at all rugose, pale, glabrous, lanceolate or oblong-lanceolate; cauline 5–9 cm. long, about 12 mm. wide, acute, only a little narrowed to a slightly or sometimes conspicuously clasping base; margins entire or low-serrate, scabrous; veins rather prominent, pale, some of them looped along the often triple-nerved, pale midrib; ultimate areolae indistinct, coarse, longer than broad; rameal leaves not much reduced, clasping: heads rather large, somewhat clustered toward ends of branches: peduncles short, leafy: involucre 5.5–7 mm. high; bracts firm, in few ranks, the outer usually shorter, oblong to lance-oblong, acute or the outer barely so, glabrous or sparingly ciliate; margins and base pale except sometimes in the outer, the green part usually indistinct below, dilated above, frequently with a pale median line: rays lilac or white, rarely purplish, with corollas 8–14 mm. long, 1.0–1.5 mm. wide: disk corollas narrowly funnel-form or tubular; lobes short, 0.6–0.9 mm. long, 18 to 28 per cent of whole length of limb: pappus hairs 35–70, each 5–6.5 mm. long: achenes apparently larger than in the other species (2–3 mm. long).—Damp banks and shores: Idaho, Saskatchewan and the bad lands of North Dakota (Herb. N. Y. Bot. Gard.) to Colorado, New Mexico and Arizona, chiefly in the mountain states. Some specimens examined: SASKATCHEWAN: Gander Lake, 1895, *Macoun*, no. 10237. IDAHO: Boise, 1897, *L. F. Henderson*, no. 2993. MONTANA: Missouri River, 1883, *L. F. Ward*, no. 3. WYOMING: Hutton's Lake, 1898, *A. Nelson*, no. 5293; Seven Mile Lakes, 1901, *Nelson*, no. 595; Laramie, 1901, *Nelson*, no. 8668; Lusk, 1911, *Nelson*, no. 9606. COLORADO: alt. 6000–8000 ft., 1877, *E. L. Greene*, no. 1122; below Steamboat Springs, 1899, *G. E. Osterhout*, no. 13; San Luis Valley, 1873, *J. Wolfe*, no. 500; along the Poudre, 1895, *C. S. Crandall*, no. 50. NEW MEXICO: 1847, *Fendler*, no. 360; Valley of Sierra de las Animas, 1851, *C. Wright*, no. 1157. ARIZONA: Black River Flat, 1874, *J. T. Rothrock*, no. 789; Speed Ranch, Rincon Mts., 1909, *J. C. Blumer*, no. 3474.



This species stands somewhat between *A. coerulescens* and the *A. adscendens* group. The texture and venation of the leaves are very similar to those of *A. adscendens*, as are also the firm bracts, but these latter are acute, and the heads are short-peduncled and more paniculate. In all the detailed measurements of parts of the head and florets it corresponds closely with *A. coerulescens* to which it is evidently related. Whether it should be considered as a member of the *Salicifoliae* is however open to question. The innermost bracts of the involucre are generally said to be narrower than the others, a condition which is said not to be the case in other species here treated, and the outer bracts are said to have a whitish median line. These statements are commonly true, though often not conspicuously so, but the same is frequently true also of *A. coerulescens* and perhaps of other species; at least they are not clear-cut characters.

Several other names exist that belong to this group of Asters. In 1815 Barton<sup>1</sup> proposed *A. philadelphicus*, later<sup>2</sup> making it a synonym of *A. tenuifolius* Willd. A Barton specimen bearing the Prodrusus label in the herbarium of the Philadelphia Academy is straight *A. ericoides* L. At the same time Barton proposed *A. tenuiculus* which later he made a variety of *A. fragilis*. Four specimens of this are in the Barton herbarium, of which three are noted as "from my garden." The fourth, which may be considered the type, bears the Prodrusus label and is *A. vimineus*. The others are *A. dumosus*, *A. ericoides* and *A. lateriflorus* var. *pendulus*. These Barton names were not included in the Kew Index.

In the Flora of North America, Torrey and Gray<sup>3</sup> described *A. Greenei* from "Near Boston, Dr. B. D. Greene! Dr. Pickering! (in herb. acad. Philad.)." The writer has been unable to locate the Greene specimen but the Pickering specimen is still in the herbarium of the Philadelphia Academy. This does not represent any straight species but seems rather to be a hybrid of *A. lateriflorus* and *A. puniceus*. The habit is that of the former species but the corolla lobes are shorter, the heads larger, the leaves broader, more clasping, and more scabrous, suggesting *A. puniceus* and some of the cauline hairs are slightly thickened at the base. The description, too, rather suggests this interpretation. It is not at all *A. praealtus* var. *angustior* which one might suspect it to be from the locality.

<sup>1</sup> Prodr. Fl. Philadel. 81 (1815).

<sup>2</sup> Comp. Fl. Phila. (1818).

<sup>3</sup> Fl. N. A. ii. 134 (1841).



In 1903 Burgess proposed *A. agrostifolius*,<sup>1</sup> based chiefly on specimens of *A. lateriflorus* var. *pendulus* (Ait.) Burgess, judging from specimens in the herbarium of the New York Botanical Garden. In 1917 Lunell<sup>2</sup> described two new Asters, *A. chelonius* and *A. clivorum*, from the foot-hills of the Turtle Mountains, Rolette County, North Dakota. The type specimens of these species, now in the herbarium of the University of Minnesota, are intermediate between *A. laetevirens* and *A. paniculatus* var. *simplex* as to leaves and involucre. Both species were known to their author from the type specimens only. Further study in that vicinity is necessary before they can be accurately placed.

It has been suggested by A. S. Pease in the paper already cited that *A. tardiflorus* is a hybrid of *A. cordifolius* and *A. puniceus*. Not all specimens so labelled in the Gray Herbarium have been seen by the writer, but several in the Cornell Herbarium certainly seem to bear out this conclusion, at least as far as most specimens called *A. tardiflorus* by American authors are concerned. There are at hand, however, several specimens from the Gray Herbarium, labelled *A. tardiflorus* and having rather narrow leaves, that are apparently hybrids of *A. puniceus* and *A. paniculatus*.

It may be of interest that specimens have recently come to light extending the range of *A. vimineus* Lam., along the Fall line through Georgia and down to the Apalachicola region of Florida. The plant has not yet been seen from North and South Carolina. *A. vimineus* was one of the species of white asters treated in the previous paper. *A. ontarionis* Wiegand, also a species treated in the previous paper and there reported from only one locality in Canada, has been found to be fairly frequent along the Canadian side of the St. Lawrence river from Kingston to Brockville.

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DESMODIUM GLABELLUM IN NORTHEASTERN CONNECTICUT.—In July and September, 1932, botanizing trips were made to Obwebetuck Hill, which is situated in the extreme south-southwestern part of Windham County, in the town of Windham. This is a wooded hill with dry soil, and is especially suited to the genera *Desmodium* and *Lespedeza*, as well as to other dry soil plants.

<sup>1</sup> *A. agrostifolius*, Small's Fl. Se. U. S. 1226 (1903).

<sup>2</sup> *A. chelonius*, Amer. Mid. Nat. v. 45 (1917), *A. clivorum*, l. c. v. 55 (1917).